

## CLAIMS

We claim:

- 5                   1.    A water-responsive homogeneous polymer  
blend composition comprising a biodegradable polymer grafted  
with a polar monomer, oligomer, or polymer or a combination  
thereof and a water-soluble polymer or a water-soluble polymer  
10                   grafted with a polar monomer, oligomer, or polymer or a  
combination thereof.
2.    The composition of Claim 1, wherein said  
biodegradable polymer is selected from poly(hydroxy  
15                   alkanoates), poly(alkylene succinates), polycaprolactones or  
mixtures thereof that are hydrolytically degradable.
3.    The composition of Claim 1, wherein said  
biodegradable polymer is selected from poly( $\beta$ -  
20                   hydroxybutyrate-co- $\beta$ -hydroxyvalerate), poly(ethylene  
succinate), poly(butylene succinate), polycaprolactone or  
mixtures thereof.
4.    The composition of Claim 1, wherein said  
polar vinyl monomer is an ethylenically unsaturated monomer  
25                   containing at least one polar functional group or said oligomer  
or said polymer is an oligomer or a polymer polymerized from  
an ethylenically unsaturated monomer containing at least one  
polar functional group.
- 30                   5.    The composition of Claim 4, wherein said at  
least one polar functional group is a hydroxyl, carboxyl, cyano,  
amino, sulfonate group or a combination thereof.
- 35                   6.    The composition of Claim 3, wherein said at  
least one polar functional group is a hydroxyl group.

7. The composition of Claim 1, wherein said polar monomer is a polar vinyl monomer.

5 8. The composition of Claim 1, wherein said polar monomer is selected from poly(ethylene glycol) acrylates, poly(ethylene glycol) alkyl ether acrylates, poly(ethylene glycol) methacrylates, poly(ethylene glycol) alkyl ether methacrylates, acrylic acid, maleic anhydride, itaconic acid,  
10 sodium acrylate, 3 hydroxypropyl methacrylate, 2-hydroxyethyl methacrylate, 3-hydroxypropyl acrylate, 2-hydroxyethyl acrylate, acrylamide, glycidyl methacrylate, 2-cyanoethyl acrylate, glycidyl acrylate, 4-nitrophenyl acrylate, pentabromophenyl acrylate, poly(propylene glycol)  
15 methacrylates, poly(propylene glycol) acrylates, 2-propene-1-sulfonic acid and its sodium salt, 2-sulfoethyl acrylate, 2-sulfoethyl methacrylate, 3-sulfopropyl acrylate, 3-sulfopropyl methacrylate or mixtures thereof.

20 9. The composition of Claim 1, wherein said polar monomer, oligomer, or polymer is selected from 2-hydroxyethyl methacrylate, polyethylene glycol methacrylate or analogs thereof.

25 10. The composition of Claim 1, wherein said polar monomer, oligomer, or polymer is 2-hydroxyethyl methacrylate or its derivatives.

30 11. The composition of Claim 1, wherein said polar monomer, oligomer, or polymer is selected from 2-hydroxyethyl methacrylate, polyethylene glycol methacrylate or analogs thereof and said biodegradable polymer is selected from poly( $\beta$ -hydroxybutyrate-co- $\beta$ -hydroxyvalerate), poly(ethylene succinate), poly(butylene succinate),  
35 polycaprolactone or mixtures thereof.

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12. The composition of Claim 1, wherein said biodegradable polymer contains from 1 to 20 weight percent grafted polar monomer, oligomer or polymer or combination thereof.

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13. The composition of Claim 1, wherein said water-soluble polymer is selected from polyethylene oxide, polyvinyl alcohol, hydroxypropyl cellulose, or polyacrylic acid.

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14. The composition of Claim 1, wherein said biodegradable polymer is selected from poly(hydroxy alkanoates), poly(alkylene succinates), polycaprolactones or mixtures thereof, and said polar monomer, oligomer, or polymer is selected from 2-hydroxyethyl methacrylate, polyethylene glycol methacrylate or analogs thereof, and said water-soluble polymer is selected from polyethylene oxide, polyvinyl alcohol, sulfonated polyester, hydroxypropyl cellulose, polyacrylamide or polyacrylic acid.

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15. A homogeneous water-dispersible polymer blend comprising from 1% to 35% by weight of a grafted biodegradable polymer and from 65% to 99% by weight of a water-soluble polymer or a grafted water-soluble polymer.

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16. A homogeneous water-disintegratable polymer blend comprising from 35% to 45% by weight of a grafted biodegradable polymer and from 55% to 65% by weight of a water soluble polymer or a grafted water-soluble polymer.

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17. A homogeneous water-weakenable polymer blend comprising from 45% to 55% by weight of a grafted biodegradable polymer and from 45% to 55% by weight of a water soluble polymer or a grafted water-soluble polymer.

18. A film comprising the composition of Claim  
1.

5 19. A fiber comprising the composition of  
Claim 1.

20. An article comprising the composition of  
Claim 1.

10 21. A method of making a selectively water-  
sensitive homogeneous polymer blend composition comprising  
the steps of:

combining a biodegradable polymer grafted with a  
polar monomer, oligomer, or polymer or a combination thereof  
15 and a water-soluble polymer at a temperature above the melting  
temperature of the water-soluble polymer and below the  
decomposition temperature of the water-soluble polymer under  
high shear; and

mixing said combination to form a homogeneous  
polymer blend composition.  
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22. The method of Claim 21, wherein said  
biodegradable polymer is selected from poly(hydroxy  
alkanoates), poly(alkylene succinates), polycaprolactones or  
25 mixtures thereof that are hydrolytically degradable.

23. The method of Claim 21, wherein said  
biodegradable polymer is selected from poly( $\beta$ -  
hydroxybutyrate-co- $\beta$ -hydroxyvalerate), poly(ethylene  
succinate), poly(butylene succinate), polycaprolactone or  
30 mixtures thereof.

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24. The method of Claim 21, wherein said polar monomer is an ethylenically unsaturated monomer containing at least one polar functional group or said oligomer or said polymer is an oligomer or a polymer polymerized from an ethylenically unsaturated monomer containing at least one polar functional group.

25. The method of Claim 21, wherein said at least one polar functional group is a hydroxyl, carboxyl or sulfonate group or a combination thereof.

26. The method of Claim 21, wherein said polar monomer is a polar vinyl monomer.

27. The method of Claim 21, wherein said polar monomer is selected from poly(ethylene glycol) acrylates, poly(ethylene glycol) alkyl ether acrylates, poly(ethylene glycol) methacrylates, poly(ethylene glycol) alkyl ether methacrylates, acrylic acid, maleic anhydride, itaconic acid, sodium acrylate, 3 hydroxypropyl methacrylate, 2-hydroxyethyl methacrylate, 3-hydroxypropyl acrylate, 2-hydroxyethyl acrylate, acrylamide, glycidyl methacrylate, 2-cyanoethyl acrylate, glycidyl acrylate, 4-nitrophenyl acrylate, pentabromophenyl acrylate, poly(propylene glycol) methacrylates, poly(propylene glycol) acrylates, 2-propene-1-sulfonic acid and its sodium salt, 2-sulfoethyl acrylate, 2-sulfoethyl methacrylate, 3-sulfopropyl acrylate, 3-sulfopropyl methacrylate or mixtures thereof.

28. The method of Claim 21, wherein said polar monomer is selected from 2-hydroxyethyl methacrylate, polyethylene glycol methacrylate or their analogs.

29. The method of Claim 21, wherein said water-soluble polymer is selected from polyethylene oxide, polyvinyl alcohol, hydroxypropyl cellulose, or polyacrylic acid.

5 30. The method of Claim 21, wherein said biodegradable polymer is selected from poly( $\beta$ -hydroxybutyrate-co- $\beta$ -hydroxyvalerate), poly(ethylene succinate), poly(butylene succinate), polycaprolactone or mixtures thereof, said polar monomer is selected from 2-  
10 hydroxyethyl methacrylate, polyethylene glycol methacrylate or their analogs, and said water-soluble polymer is selected from polyethylene oxide, polyvinyl alcohol, hydroxypropyl cellulose, polyacrylamide, sulfonated polyester, or polyacrylic acid.

15 31. A method of making a water-responsive biodegradable polymer blend composition comprising a single step of combining a biodegradable polymer, a water-soluble polymer, a polar vinyl monomer and a free radical initiator  
20 under sufficient heat, high shear and high intensity dispersive mixing such that said biodegradable polymer and said water-soluble polymer are grafted with said polar vinyl monomer and said biodegradable polymer said water-soluble polymer form a homogeneous blend.

25 32. Water-sensitive polymer blends of a modified, biodegradable polymer selected from poly(hydroxy alkanoates), poly(alkylene succinates), polycaprolactones or mixtures thereof that are hydrolytically degradable and a  
30 modified water-soluble polymer.

33. Water-sensitive polymer blends of modified  
35 poly(ethylene) oxide and modified poly(hydroxy alkanoates), poly(alkylene succinates), polycaprolactones or mixtures thereof that are hydrolytically degradable.

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